

A REVIEW OF THE EXTINCT AVIAN GENUS, *MANCALLA*

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ABSTRACT: With the large number of fossil bones of the flightless auk, *Mancalla* (Charadriiformes: Alcidae: Mancallinae) now at hand, it has been possible to study variability within the genus, verify the assignment of the Corona del Mar specimens to the genotype, *Mancalla californiensis*, and demonstrate statistically the presence of two species in the San Diego Formation. The name *Mancalla diegense* must now be applied to the larger (and less well represented) of the two San Diego species. The smaller, more abundant species is described here as *Mancalla milleri*.

New locality records for the genus are cited, extending its range to Crannell, Humboldt County, California, in the north, and to Cedros Island, Baja California, in the south.

INTRODUCTION

Since the last major report on the genus *Mancalla* (Miller and Howard, 1949), much additional material has become available from the previously recorded localities within the city of San Diego, California and from the Corona del Mar site near the upper end of Newport Bay, Orange County, California. Where before there were but four bones from the latter locality, representing only carpometacarpus, tarsometatarsus (2) and vertebra, there are now fourteen, including another tarsometatarsus and three more carpometacarpi, and adding coracoid, two humeri (proximal and distal ends), ulna, radius and tibiotarsus. From the several San Diego sites, over 350 specimens are added, bringing the total now available close to 500, in contrast to 145 in 1949. This material is included in the collections of the Los Angeles County Museum of Natural History (LACM, approximately 400), University of California Museum of Paleontology (UCMP, 48), the Loye H. Miller collection of the University of California at Los Angeles (LHM, 50), and the San Diego State College (SDSC, 3).

Besides the material from these previously discussed sites, three new areas of occurrence of *Mancalla* have come to light. One is located in northern California, near the small town of Crannell (Humboldt County), another in southern California, in Laguna Hills (Orange County), and the third on Cedros Island, Baja California, Mexico. A perfect humerus at Humboldt State College (HSC) is the sole representative from the northern locality (HSC locality 197). Localities LACM 65120 and 65121 in the Laguna Hills area have yielded 26 bones, most of which are incomplete with contours obscured by mottled coloring and roughened surfaces. The 55 bones from Cedros Island were collected on an expedition from the University of California,

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Riverside (UCR), and were donated to the Los Angeles County Museum of Natural History (LACM localities 65144 to 65154 inclusive). Although many of the Cedros bones are incomplete, the contours are clear and preservation is good. In several instances skeletal elements of one individual were found together.

The increased representation of *Mancalla* has provided the opportunity of determining variability within the genus, and the associated skeletal material from Cedros Island has contributed to an understanding of skeletal proportions. The present Catalogue of Fossil Birds (Brodkorb, 1967) lists *Mancalla californiensis* from the type locality in Los Angeles and from the Corona del Mar site, and only *M. diegensis* from San Diego. Both Miller (1956) and Howard (1966), however, have indicated increasing confidence that the great size range in specimens from San Diego indicates that more than one species of *Mancalla* is represented there. The present study not only corroborates this belief, but clarifies the species assignments, resulting in the recognition and description of a new species from San Diego.

The Humboldt County humerus and the Laguna Hills bones resemble the San Diego specimens, but the Cedros Island material is distinct. The description of this species will be included in a report on the entire fossil avifauna from the Cedros Island localities.

ANALYSIS OF SPECIES

Mancalla californiensis Lucas

The type of *Mancalla californiensis* (a humerus lacking the distal end) is the only representative of the species recorded from the type locality—the Third Street tunnel excavation in Los Angeles (Lucas, 1901).

The later record of *M. californiensis* from Corona del Mar (Howard, 1949) was based on the large size of the carpometacarpus (no humerus being represented). At San Diego, the few fragments of large humeri among the much more abundant small specimens suggested *M. californiensis* (Miller, 1956), but these were too imperfect for anything except a size comparison.

Later excavations have brought to light a proximal end of a humerus from Corona del Mar and several well-preserved specimens of the element from San Diego that equal or closely approximate the type of *M. californiensis* in length and/or breadth of proximal end. It is, therefore, at last possible to make direct comparison with the type of *M. californiensis*—a good cast of which is at hand.

It was previously noted by Miller and Howard (1949) that the type humerus of *M. californiensis* differed from the then available San Diego humeri not only in its large size, but in the position of the muscle scar at the median border of the pneumatic fossa, and the character of the adjacent depression. The difference was described as follows (*op. cit.*: 209): "In the type of *Mancalla californiensis* the proximal tip of this scar is situated farther

within the fossa than in any of the San Diego specimens, and the depression is thus allowed to extend farther proximally as well, taking the form of a distinct groove with clear-cut, ridgelike edges running up alongside the median partition of the fossa." The specimen from Corona del Mar (LACM 2576) matches the type of *M. californiensis* precisely. It is further notable that in both the type and the Corona del Mar humeri these "ridgelike edges" remain separate for their full extent up into the pneumatic fossa, whereas in the San Diego specimens they converge proximally.

Other distinctions in the type humerus of *M. californiensis* and the large humeri from San Diego pertain to the greater curvature of the shaft in the former and the less prominent projection of the distal contour of the bicipital crest. The shaft character can be observed only in the type of *M. californiensis*, the Corona del Mar humerus is broken below the bicipital crest.

Distinction between the Corona del Mar and the San Diego material is evidenced also in the coracoid, ulna, radius, carpometacarpus, tibiotarsus and tarsometatarsus. Characteristics of these elements from Corona del Mar are now assumed to apply to the species *M. californiensis*. See Table I. With the exception of the carpometacarpi, all available specimens from Corona del Mar fall within the range in size of the San Diego bones in linear dimension. The carpometacarpi are longer and have a longer process of metacarpal 1.

Measurements of Corona del Mar specimens assigned to *Mancalla californiensis*: Humerus (LACM 2576) greatest breadth of proximal end 19.4 mm; (LACM 2577) breadth and depth of shaft above ectepicondylar process 4.7 x 10.2 mm. Coracoid (LACM 2581) height from below scapular facet to middle of head 18.8 mm; breadth across furcular facet 8.7 mm; breadth through triosseal canal, 5.9 mm; height of furcular facet at tip 5.1 mm. Ulna (incomplete, LACM 2580) depth of shaft 6.7 mm; depth of proximal end (estimated) 10.7 mm. Radius (LACM 2579) greatest length 29.7 mm; greatest depth of shaft 6.8 mm. Carpometacarpus (LACM 2578) greatest length 41.3 mm; height of process of metacarpal 1, 17.7 mm; greatest depth of proximal end through process of metacarpal 1, 11.0 mm; breadth of proximal trochlea 4.8 mm. Tibiotarsus (LACM 2424) estimated length 87.5 mm; breadth of proximal end 8.6 mm; least breadth of shaft 6.1 mm. Tarsometatarsus (LACM 2250) length from intercotylar tuberosity to external trochlea (middle trochlea broken) 39.3 mm; breadth of distal end 9.3 mm; breadth of proximal end 9.9 mm; breadth of shaft (middle) 4.8 mm.

Mancalla diegensis (Miller)

The large collection of *Mancalla* bones now available from San Diego exhibits a greater size range than was previously suggested by the material available in 1949. The humerus is the best represented element. Of over 130 humeri now at hand, 100 can be measured for proximal or distal breadth

TABLE I
Comparison of *Mancalla californiensis* and *M. diegensis*

Element	<i>M. californiensis</i>	<i>M. diegensis</i>
HUMERUS	Muscle scar well within pneumatic fossa and ridgelike edges of depression parallel	Scar less extended within fossa and ridges converging.
	Curvature of shaft pronounced	Shaft straighter
	Contour of bicipital crest rounded distally	Crest prominently projected distally (angular)
CORACOID	Anterior border of triosseal canal slightly posterior to anterior border of shaft	Border of triosseal canal forming anterior border of the bone
	Upper surface of head broad; smoothly rounded	Upper surface of head narrow with central ridge
	Tip of furcular facet blunt; no upturned point	Tip of furcular facet with up-turned point
ULNA	Proximal profile from olecranon to cotylae broad and shallow; olecranon blunt	Profile depressed; olecranon more bulbous
	Palmar side of shaft above distal end flat, bordered by well-marked intermuscular lines	Palmar side of shaft rounded; slanting from internal to external side
RADIUS	External surface smooth; no depression below head	External surface rugose, with marked depression below head
	Groove on lateral edge extending nearly halfway up shaft	Groove extending less than $\frac{1}{3}$ length of bone
CARPOMETACARPUS	Length 41 mm; length process metacarpal 1, 16.6-17.7 mm	Maximum: length 37 mm; length process metacarpal 1, 15.4 mm
	Internal trochlear crest not clearly separated from M 3	Base of internal trochlear crest clearly separated from M 3
TIBIOTARSUS	Proximo-internal ligamental attachment short, broad, flat and partly on posterior surface of shaft	Attachment long, thin straight ridge on internal edge shaft
TARSOMETATARSUS	Center of shaft (anteriorly) level or convex; external border indistinctly raised	Marked groove extending proximally from distal foramen to external edge; external border raised for full shaft length

and 34 of these also provide a linear measurement. In length, the maximum bone is 151 per cent of the minimum, with a coefficient of variability (V) of 10.2 for the series. In a series of 300 humeri of the flightless auk, *Pin-guinis impennis*, recorded by Lucas (1888:521), the maximum bone is only 114 per cent of the minimum in greatest length, and the series has a V of 3.0.

The distribution curve for length of the *Mancalla* humeri is roughly bimodal. The 26 specimens that fall below 66.6 mm form a normal curve with a mode of 63 mm and a mean of 62.7 mm. The remaining seven specimens are scattered from 71 to 85 mm with a mean of 76.5 mm. The 64 specimens in which proximal breadth can be measured provide a distinct bimodal curve where the smaller specimens range from 14.2 to 16.4 mm with a mean of 15.3 mm, and the larger bones range from 17.3 to 20.3 mm with a mean of 18.7 mm.

Bimodality of curve plus a large coefficient of variability is suggestive of heterogeneity of the sample according to Simpson, Roe and Lewontin (1960:102 and 205). They state further (*op. cit.*: 207) that unless changes due to growth are involved, a homogeneous sample for a linear dimension usually has a V of 3 to 7 in mammals, and is lower in birds. That the range in *Mancalla* cannot be attributed to age is evidenced by the state of ossification of the bones measured.

TABLE II
Size Range and Variability in Length¹ of Limb Elements
of *Mancalla* from San Diego

Element	Number of specimens	Length in mm			Ratio of maximum to minimum (in percent)	Coefficient of variability (V)
		max.	mean	min.		
Coracoid	21	54.0	43.5	39.0	138	11.1
Humerus	34	85.2	65.9	56.4	151	10.2
Ulna	23	32.1	26.3	23.6	135	7.8
Radius	9	31.8	27.1	24.2	131	11.5
Carpometacarpus	14	37.2	33.4	29.6	125	7.5
Femur	14	57.0	50.1	44.9	127	7.6
Tibiotarsus	15	98.7	82.8	72.0	137	11.2
Tarsometatarsus	9	43.6	36.6	31.1	140	11.4

¹Lengths are measured as follows: coracoid from head (lateral to furcular facet) to sternal facet (lateral to internal distal angle); humerus, from head to internal condyle; ulna, from intercotylar ridge to internal condyle; carpometacarpus, from external crest of trochlea to distal end of metacarpal 2; tibiotarsus, from proximal articular surface to distal end; radius, femur and tarsometatarsus, greatest length.

These statistical criteria applied to the *Mancalla humeri* indicate heterogeneity of the San Diego sample, and comparison with the lesser range and small V of the *Pinguinis humeri* lends further support. As the large and small bones are intermingled throughout the deposits, it seems reasonable to assume that the distinction is specific rather than subspecific. Previously it was assumed that, if two species were represented, the larger one was *M. californiensis*. We have seen above (Table I), however, that none of the San Diego material can be assigned to *M. californiensis*.

The size range and coefficient of variability has been determined for all of the limb elements of the San Diego *Mancalla*. Each shows a wide range in measurement of length and a V greater than 7 (see Table II). For the type element of *M. diegense*, the femur, exact measurement of greatest length can be made on 10 specimens and estimated on another four. Breadth of distal end can also be measured. Five bones have a length from 57.0 to 53.8 mm and a distal breadth from 11.1 to 9.7 mm. The other nine measure from 51.1 to 45.0 mm in length with a distal breadth from 9.3 to 8.4 mm. The type of *M. diegense* (UCMP 33409) measures 56.3 mm in length and 11.0 mm in distal breadth—next to the maximum in both measurements and 25 per cent longer than the minimum specimen. From these figures it is concluded that the name *Mancalla diegense* must now be applied to the large San Diego species rather than to the more abundant small form. The small form is, therefore, here described as new.

In some elements the point of linear separation between the large and small species is not clearly demarcated. To determine the placement of "borderline" specimens, measurements of breadth and qualitative characters were taken into account (see Tables III and IV). Comparisons with the partial skeletons from Cedros Island were also helpful, as this island species was apparently near in size to *M. diegense*.

In the San Diego collection, approximately 50 complete limb elements and an equal number of incomplete specimens are now identified as *M. diegense*. Among these, the following were illustrated by Miller and Howard (1949): scapula LACM 2176 and 2049 (Pl. 4, Figs. 5 and 7); coracoid LACM 2087 and 2067 (Pl. 3, Figs. 2 and 3); humerus LHM 2270 and 2220 (Pl. 3, Figs. 6 and 14; ulna LACM 2064 (Pl. 3, Fig. 7); carpometacarpus LACM 2068 (Pl. 4, Fig. 16); femur LHM 2220 (Pl. 4, Fig. 2); tibiotarsus LACM 2125 and LHM 2270 (Pl. 4, Figs. 9 and 11), and LACM 2177 (Pl. 5, Fig. 1); tarsometatarsus LACM 2178 and 2177 (Pl. 5, Figs. 4 and 5). One sternal fragment (LACM 2333) and one cranium with associated rostrum (LACM 2633) are outstandingly large and are tentatively assigned to *M. diegense*.

The humerus from Humboldt County conforms in all respects with humeri of *M. diegense* and is so assigned. Measurements of this bone are as follows: length 81.3 mm, breadth of proximal end 19.5 mm. Preservation of the Laguna Hills specimens is poor, but all are clearly distinct from *M. californiensis*. With the exception of two small ulnae, all appear to resemble *M. diegense* and are tentatively so assigned.

Mancalla milleri, new species

Holotype: Complete left femur, LACM 2185, collected by Clifford Kennell, Dec. 26, 1947. Illustrated in Miller and Howard, 1949, Plate 5, Fig. 3, as "*Mancalla diegense*."

Locality: LACM locality 1070, east side of Curlew Street, across from end of Ostego Drive, San Diego, California.

Paratype: Complete left humerus, LACM 2813, collected July, 1962 from type locality.

Formation and Age: San Diego Formation, Middle (?) Pliocene.

Referred Material: In addition to the type and paratype, 87 limb elements on which a measurement of length can be made are referred to

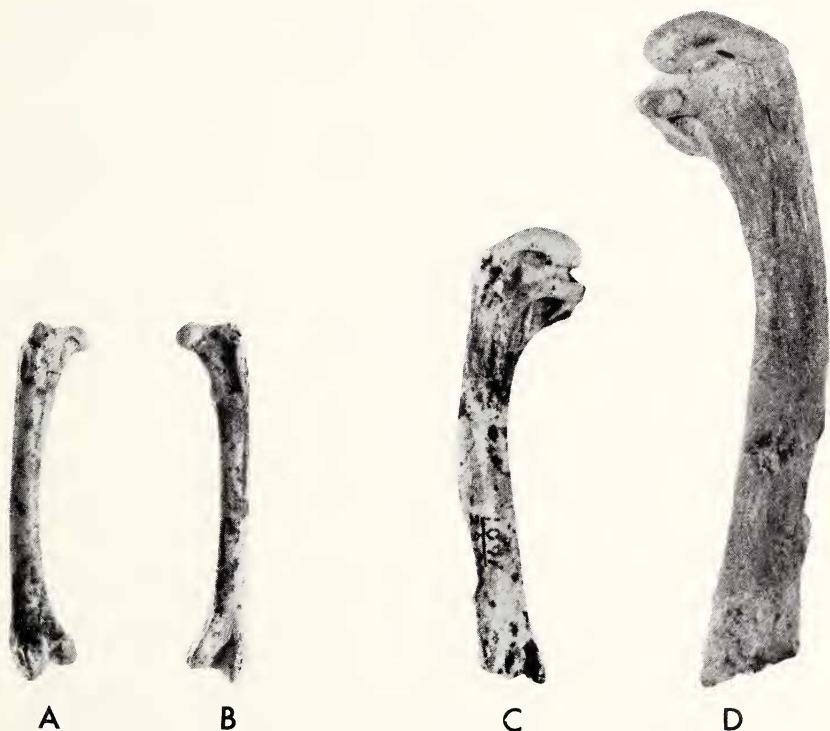


FIGURE 1. A.-C. *Mancalla milleri*, new species: A. Type femur (LACM 2185) posterior view; B. type femur anterior view; C. paratype humerus (LACM 2813) anconal view. D. *Mancalla diegense* Miller, maximum available humerus (LACM 2670) for comparison with *M. milleri*. Natural size. Los Angeles County Museum of Natural History Photos.

M. milleri, as follows: 12 coracoids, 25 humeri, 16 ulnae, 6 radii, 7 carpo-metacarp, 8 femora, 8 tibiotarsi and 5 tarsometatarsi. There are also 13 scapulae and at least five incomplete sterna, two pelves, a cranium, and numerous incomplete limb bones whose size indicates assignment to *M. milleri*. The following elements illustrated by Miller and Howard (1949) as "*Mancalla diegensis*" are now assigned to *Mancalla milleri*: scapulae LACM

TABLE III
Estimated Size Range (in millimeters) of Specimens of
Mancalla diegensis and *M. milleri*

Element	<i>M. diegensis</i>			<i>M. milleri</i>		
	Max.	Mean	Min.	Max.	Mean	Min.
Scapula						
Breadth articular end	14.4	13.5	12.5	11.8	10.9	10.3
Coracoid						
Length	54.0	49.1	47.5	43.5	40.0	38.5
Breadth below furcular facet	6.3	5.8	5.4	5.1	4.9	4.0
Humerus						
Length	85.2	76.5	71.0	66.6	62.7	56.4
Breadth proximal end	20.3	18.7	17.3	16.4	15.3	14.2
Ulna						
Length	32.1	29.4	28.0	27.0	25.3	23.6
Breadth proximal cotylae	6.6	6.4	5.9	5.7	5.2	4.5
Radius						
Length	31.8	30.9	29.6	26.9	25.1	24.2
Greatest depth shaft	6.4	6.35	6.3	5.6	4.9	4.6
Carpometacarpus						
Length	37.2	35.6	35.0	33.2	31.6	29.6
Depth proximal end through metacarpal I	11.0	10.3	9.7	9.5	9.1	8.8
Femur						
Length	57.0	55.2	53.8	51.1	47.9	45.0
Breadth distal end	11.0	10.2	9.7	9.3	9.0	8.4
Tibiotarsus						
Length	98.5	90.2	81.0	77.5	74.9	72.0
Breadth distal end	10.7	9.0	8.2	7.9	7.2	6.5
Tarsometatarsus						
Length	43.6	39.9	38.0	36.0	34.0	31.1
Breadth proximal end	10.7	9.6	8.7	8.4	8.0	7.2

2070 and LHM 2270 (Pl. 4, Figs. 4 and 6); coracoid LHM 2270 (Pl. 3, Fig. 1); humeri LHM 2218 (Pl. 1, Fig. 1), LHM 2269, LACM 2066, 2096, and LHM 2281 (Pl. 2, Figs. 1, 2, 3 and 4); ulnae LACM 2069 (Pl. 1, Fig. 1), LACM 2082 (Pl. 1, Fig. 2 and Pl. 3, Fig. 8), LACM 2079 and 2101 (Pl. 3, Figs. 9 and 10), and LACM 2179 (Pl. 5, Fig. 2); radius LHM 2270 (Pl. 1, Figs. 1 and 6, and Pl. 4, Fig. 3); carpometacarpi LHM 2068 (Pl. 1, Figs. 1 and 3, and Pl. 4, Fig. 15), and LHM 2281 (Pl. 4, Fig. 17); femur LACM 2097 (Pl. 4, Fig. 1); tibiotarsi LACM 2083, 2100 LHM 2270, LACM 2108 and 2134 (Pl. 4, Figs. 8, 10, 12, 13 and 14); sterna LHM 2220 and LACM 2063 (Pl. 2, Figs. 6 and 7) and LACM 2180 (Pl. 6, Fig. 1); pelvis LHM 2281 (Pl. 2, Fig. 5) and LACM 2182 (Pl. 6, Fig. 2).

TABLE IV
Qualitative Characters
Distinguishing *Mancalla diegense* and *M. milleri*

<i>Mancalla diegense</i>	<i>Mancalla milleri</i>
<i>Coracoid</i> : anterior edge of furcular facet projected anteriorly; tip raised slightly and gradually.	<i>Coracoid</i> : anterior edge of furcular facet nearly on line with anterior contour of triosseal canal; tip up-swept anteriorly, with abruptly raised high, pointed tip.
<i>Humerus</i> : distal contour of bicipital crest (viewed anconally) almost a right angle, with prominent ligamental attachment at base of bicipital crest.	<i>Humerus</i> : distal contour of bicipital crest less angular, and ligamental attachment less projected.
<i>Ulna</i> : olecranon blunt, and straight with respect to shaft contour (in lateral view); very faint depression internal to olecranon.	<i>Ulna</i> : olecranon as in <i>M. diegense</i> but internal depression deeper.
<i>Femur</i> : obturator ridge relatively short, with generally rounded contour; very slight depression internal to ridge.	<i>Femur</i> : obturator ridge relatively long, with angular contour sharply defined by deep depression along internal edge of ridge.
<i>Tibiotarsus</i> : posterior contour of proximal articular surface with deep notch separating the external and internal portions of surface.	<i>Tibiotarsus</i> : slight indentation between external and internal portions of proximal articular surface, but no deep separation.
<i>Tarsometatarsus</i> : Viewed anteriorly, proximal end flared; external border of shaft sharper than internal; shaft moderately depressed.	<i>Tarsometatarsus</i> : Bone columnar in appearance; both borders of shaft (anteriorly) sharply defined; shaft well depressed anteriorly.

Diagnosis: Type femur 16 per cent shorter than type of *M. diegense*; deep excavation on internal side of obturator ridge. Mean of nine femora 13 per cent shorter than mean of five femora of *M. diegense*. Paratype humerus 25 per cent shorter than type of *M. californiensis* (using dimension of length from proximal end to distal tip of deltoid crest to accommodate to incomplete specimen of *M. californiensis*); mean of 25 humeri 18 per cent shorter in over all length than mean of 7 humeri of *M. diegense*.

Description: The smallest known species of *Mancalla*; averaging 12 to 19 per cent smaller than *M. diegense* in comparable elements (see Table III). Poor preservation of the San Diego material, and considerable variability make qualitative distinctions from *M. diegense* difficult to observe. Those which appear to be constant are shown in Table IV.

Of ten specimens of tibiotarsi in which the supratendinal bridge is fully ossified and intact, seven are clearly assignable to *M. milleri*. This fact indicates that the small size of the tibiotarsi cannot be attributed to immaturity.

Measurements of type and paratype: Femur LACM 2185, greatest length 47.3 mm; depth through trochanter and obturator ridge 6.3 mm; breadth of distal end 8.2 mm; least breadth of shaft 4.0 mm. Humerus LACM 2813, length to internal condyle 58.1 mm; breadth of proximal end 14.8 mm; breadth of distal end 5.2 mm; length from head to distal tip of deltoid crest 38.7 mm.

See Table III for size range of all specimens assigned to *M. milleri*.

A MOUNTED SKELETON OF MANCALLA

A composite mount of *Mancalla* is displayed at the Los Angeles County Museum of Natural History (see Howard, 1953). At the time of selection of material for the mount, in 1953, there were 224 bones of *Mancalla* in the museum collection, representing at least fragmentary specimens of the main elements. Vertebrae, ribs and phalanges, however, were incompletely represented, and these elements were supplied from a modern skeleton of *Uria aalge californica*.

For the skull and pelvis the choice was limited to one good specimen each (LACM 2205 and 2182 respectively). The two available sterna appeared to correlate in size with the pelvis, and the better specimen was chosen (LACM 2063). The choice of coracoids (LACM 2243 and 2208) was based on the proper fit of the sternal facet into the coracoidal sulci of the sternum. Two scapulae (unnumbered) appeared suitable for articulation with the coracoids, and two humeri (LACM 2442 and 2303), in turn, seemed to conform reasonably well to the glenoid area formed by the coracoid and scapula.

In accordance with the size now established for these elements of the two San Diego species, the humeri and scapulae are found to be of average size for *M. milleri*; the right coracoid is slightly above average, the other slightly below; the single radius (LACM 2335) available at the time proves to be slightly above average for *M. milleri*; the ulnae (LACM 2543 and

2544) and carpometacarpi (LACM 2213 and an unnumbered specimen) fall within the size range for *M. diegense*. Femora were scarce, but one complete (LACM 2097) and one proximal end (unnumbered) seemed appropriate for the size of the acetabulae of the pelvis. The complete left femur proves to be considerably above the average for *M. milleri*, but still within its size range. The right tibiotarsus and tarsometatarsus (LACM 2177) that were found together in the matrix (see Miller and Howard, 1949: 226) were chosen for the other two elements of the leg. Both specimens are near the borderline between *M. diegense* and *M. milleri* in length but are now considered to be of minimum size for *M. diegense*. Also the contours of the tarsometatarsus and the stocky proportions of the tibiotarsus are characteristic of *M. diegense*. The character of the proximal articular surface of the tibiotarsus described in Table IV cannot be ascertained now that the bone is in the mount. However, the illustration of the specimen (Miller and Howard, 1949: Pl. 5, Fig. 1b) suggests the separation of the two surfaces as in *M. diegense*.

In the light of our present knowledge of *Mancalla*, the mount which we hoped would represent an average-sized specimen of the dominant San Diego species, is above the average of *M. milleri* in many of its elements and disproportionately large in the terminal segments of the wing and leg. If our judgment is correct concerning the size break between *M. diegense* and *M. milleri*, the skull, limb girdles, sternum, humeri, radius and femora represent *M. milleri*. But the ulna, carpometacarpus, tibiotarsus and tarsometatarsus represent *M. diegense*. Herein lies an excellent example of the pitfalls of building a composite mount!

SUMMARY AND CONCLUSIONS

With three times more specimens at hand, than were available to Miller and Howard (1949) at the time of their comprehensive report on *Mancalla*, the present study has contributed considerably to an understanding of the taxonomy and distribution of the genus.

1. The geographic distribution of the genus is enlarged from southern California to a wide extent along the west coast of North America from Humboldt County, California in the north to Cedros Island, Baja California, Mexico in the south.

2. Identification of *Mancalla californiensis* from the Corona del Mar locality, formerly based only on size, is confirmed by the discovery of a humerus at the latter locality comparable to the type specimen from Los Angeles.

3. The greatly enlarged collection of *Mancalla* bones from the San Diego sites exhibits so great a range in size that the presence of two species, as previously postulated, can be statistically demonstrated.

4. The larger of the two San Diego species conforms with *Mancalla californiensis* in size, but differs qualitatively. The type femur of *M. diegense*

is found to be one of the largest of the femora in the collection, and the large San Diego species, therefore, takes the name of *M. diegensis*.

5. The smaller, more abundant species from San Diego is described in honor of the late Professor Loye Miller, whose contributions have formed the basis for the growth of paleornithology on the west coast.

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It has been a privilege to have had numerous conferences with the late Professor Loye Miller during the period of this study, and to have had his blessing on the conclusions reached.

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